

WHAT IS CLAIMED IS:

5

1. A semiconductor device comprising:
a carrier substrate;
an integrated circuit chip mounted on the carrier substrate
through bumps; and

10

a capacitor provided to stabilize operation of the
integrated circuit chip at high frequencies,

wherein the capacitor is electrically connected to pads on
bottom of the integrated circuit chip, and the capacitor is
provided to have a height on the carrier substrate that is smaller
than or equal to a height of the bumps on the carrier substrate.

15

20

2. The semiconductor device of claim 1 wherein the
capacitor is provided with a substrate having a bottom surface in
contact with a top surface of the carrier substrate on which the
integrated circuit chip is mounted.

25

30

3. A semiconductor device comprising:
a carrier substrate;
an integrated circuit chip mounted on the carrier substrate;
a capacitor provided to stabilize operation of the
integrated circuit chip at high frequencies; and

35

a lead frame provided on the carrier substrate and
electrically connected to the integrated circuit chip through a
wire,

wherein the capacitor is electrically connected to pads on
the integrated circuit chip, and the capacitor is provided to have

a height on the integrated circuit chip that is smaller than a height of the wire on the integrated circuit chip.

5

4. The semiconductor device of claim 1 or 3 wherein the carrier substrate is made of silicon.

10

5. The semiconductor device of claim 1 wherein the capacitor is provided with a dielectric layer containing a dielectric oxide, and the dielectric oxide of the dielectric layer is made of a composite oxide which contains at least one of elements including Sr, Ba, Pb, Zr, Bi, Ta, Ti, Mg, and Nb.

20

6. The semiconductor device of claim 1 wherein the capacitor is provided to have upper and lower electrodes which interpose a dielectric layer therebetween, and the upper and lower electrodes containing at least one of metallic elements or metallic oxides including Pt, Au, Cu, Pb, Ru, Ru oxide, Ir, Ir oxide, and Cr.

30

7. The semiconductor device of claim 1 wherein the capacitor is provided with a substrate and pads, and a thickness of the capacitor, including the substrate and the pads, is set to 50 micrometers or less.

35

8. The semiconductor device of claim 1 wherein the capacitor is a thin-film capacitor which includes a substrate, an upper electrode, a lower electrode and a dielectric layer, and the dielectric layer being interposed between the upper electrode and the lower electrode on the substrate of the capacitor.

9. The semiconductor device of claim 1 wherein the capacitor is provided with a substrate having a bottom surface which does not contact a top surface of the carrier substrate on which the integrated circuit chip is mounted.

15

10. The semiconductor device of claim 3 further comprising a resin mold, the capacitor being enclosed in the resin mold.

20

25

30

35